

TITLE OF THE INVENTION

HOLLOW GLASS PRODUCT WITH OFFSET COLLAR AXIS AND PROCESS OF  
MANUFACTURING THE SAME

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CROSS-REFERENCE TO RELATED APPLICATION

The present application claims priority under 35 U.S.C. §119 to French Patent  
Application No. 99/03718, filed March 25, 1999, entitled "Hollow Glass Product With Offset  
Collar Axis." The contents of that application are incorporated herein by reference in their  
entirety.

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BACKGROUND OF THE INVENTION

Field of the Invention

The present invention pertains to a hollow glass product and a process of  
manufacturing the same.

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Description of the Background

The traditional processes that are extensively used at the present time to fabricate the  
aforementioned products utilize so-called I.S. (Individual Section) machines and are known  
under the names of "blown-blown" and "press-blown" processes. During the first stage of  
these traditional processes, a ball or drop of glass is introduced into a roughing mold and  
shaped into a form of a rough mold. The base of the roughing mold is extended by a collar  
mold used for shaping an upper opening part of a product to be fabricated in the rough mold.

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The collar mold also has the function of gripping the rough mold in a subsequent  
operation of turning over the rough mold prior to the second stage in which the roughing  
mold is replaced by a finishing mold. In the finishing mold, the rough mold is shaped into a  
final hollow product by blowing.

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Among the processes currently being used, the "blown-blown" process can be broken  
down into the following stages:

- *loading*: a drop or ball of glass enters due to the effect of its own weight into a first mold (a roughing mold) through its upper end which corresponds to the bottom of a final product such as a bottle, etc.;

5 - *compression*: after loading, a rough bottom section closes the roughing mold; then a blast of compressed air forces the drop of glass in the roughing mold through the intermediary of the roughing mold into the lower part of the mold in which a collar of the final product is later formed; this compression also ensures good thermal contact between the drop of glass and the roughing mold;

10 - *perforation*: a punch of small dimensions, taking up approximately the height of the collar and fitted at the lower part of the roughing mold, detaches from the lower part of the roughing mold, thereby leaving room for compressed air to be delivered, the compressed air pushes in front of it the hot, less viscous glass located in the vicinity of the axis of the roughing mold, while the more viscous cold glass that has been cooled upon contact with the mold remains in place; a blank or a rough mold of the final product is thereby produced;

15 - *transfer*: when the blank is sufficiently cooled in the roughing mold for handling, the blank is transferred into a second mold (a finishing mold) which has a shape of the final product;

20 - *elongation and blowing*: once the blank is placed in the finishing mold, the blank is allowed to lengthen for a certain amount of time before blowing in order to give the shape of the product; this lengthening stage allows the glass to be distributed throughout the product;

- *extraction*: upon contact with the finishing mold, the glass cools quickly, and when its viscosity is sufficiently low, the product is extracted from the finishing mold.

25 The "press-blown" process differs from the "blown-blown" process only in the phase of shaping a blank or rough mold. In the "press-blown" process, a blank is obtained by compression of the glass in the closed roughing mold by means of a more or less lengthy punch that penetrates into the mold in the bottom of the latter through the collar mold. There are therefore no compression or perforation stage, and the opening of the product is formed in a single operation by this pressing.

These processes allow one to make products with shapes that are axisymmetrical or not. The device, which is used here as indicated above, comprises only one section of an individual section machine, which has several of them.

## SUMMARY OF THE INVENTION

However, more and more complex shapes of products have been envisaged for applications of packaging in the perfume and cosmetic industries, in particular. According to the present invention, a collar would no longer have to be positioned at the end of a flask, jar, etc., but may be positioned on a side of their bodies.

The first purpose of the invention therefore consists of a glass product that includes a body and a collar; this product is distinguished by the fact that the axis of at least one part of the body and the axis of the collar are not parallel.

Advantageously, the aforementioned part of the body represents a substantial proportion of the quantity of glass constituting the product, that is, at least 20%, and preferably at least 60%.

According to the present invention, the axis of the at least one part of the body and the axis of the collar in the glass product form an angle equal to at least  $60^\circ$  but less than  $180^\circ$ , preferably between  $90$  and  $150^\circ$ .

As mentioned previously, a product according to the present invention includes a bottle, a flask or a jar in a preferred manner.

In order to fabricate this product, a collar mold is initially held in its traditional position in roughing and finishing molds, that is, in the vertical position of the axis of the collar mold at the lower end of the cavity of the roughing mold and at the upper end of the cavity of the finishing mold, respectively. Such an arrangement is difficult to achieve industrially, since it essentially requires, for many forms of implementation of the product of the invention, that a ball of molten material be introduced into the cavity of the roughing mold through a non-vertical entrance section of the roughing mold. This characteristic is prejudicial to the distribution of the molten material in a compact and homogeneous mass at the bottom of the cavity of the roughing mold and especially near the collar mold. In fact, the contact of the molten material with the walls of the cavity is increased, and therefore, the

cooling of the material by the mold also increases. The increased viscosity of the material that thereby results is harmful to the progression of the material toward the bottom of the cavity. In order to overcome such a problem, the inventors have offset the axis of the collar mold in the roughing mold and in the finishing mold with respect to their vertical axes.

5 Thus, a second object of the invention is to provide a fabrication process of a glass product as described previously, which includes the stages of:

introducing a ball of molten material into the cavity of a roughing mold of which at least one input section for receiving the ball is approximately vertical;

10 allowing the ball of molten material to thoroughly penetrate into the bottom of the roughing mold, the bottom of the roughing mold including a part which corresponds to the collar of the final product;

perforating a collar by movement of a punch along a non-vertical axis;

possibly carrying out blowing through the collar following the extraction of the punch for the purpose of definitive shaping of the blank;

15 transferring the blank into a finishing mold by turning over the blank 180° with respect to a horizontal axis; and

performing blowing through the collar in order to give the product its final shape.

The allowing process described above may be assisted by blowing, for example, compressed air.

20 In conformity with the preferred characteristics of the process, the input section of the molten ball represents at least 20%, in a particularly preferred way, at least 60% of the total volume of this cavity, and the axis of translation of the punch forms an angle equal to at least 60° but less than 180°, preferably between 90 and 150° with respect to the vertical.

25 A third object of the present invention is to provide an individual section machine which can be used for the fabrication of a product as described above. Such an individual section machine includes a collar mold, a roughing mold in which at least one substantial upper part of the cavity is approximately vertical, and a finishing mold, wherein the collar mold is configured to be alternately positioned in the roughing and finishing molds such that

the axis of the collar mold forms an angle equal to at least 60° but less than 180° with respect to the vertical.

#### SUMMARY OF THE INVENTION

5 An object of the present invention is to provide a novel process for manufacturing a hollow glass object having the collar with an offset axis.

Another object of the present invention is to provide a hollow glass object having the collar with an offset axis.

10 Another object of the present invention is to provide an device for implementing the novel manufacturing process described above.

15 The first object may be accomplished by a process of manufacturing a hollow glass product with an offset collar axis, including the steps of inserting molten material into a cavity of a roughing mold, allowing the molten material to penetrate into a bottom portion of the roughing mold, perforating a collar by moving a punch into the bottom portion of the roughing mold along a non-vertical axis, extracting the punch from the bottom portion of the roughing mold, thereby completing processes of shaping the molten material into a blank, transferring the blank into a finishing mold by turning over the blank 180° with respect to a horizontal axis, and blowing the blank through the collar in the finishing mold such that the blank shapes into a hollow glass product. The cavity includes at least one input section which  
20 is substantially vertical.

The second object may be accomplished by a glass product including a body having at least one part, and a collar formed on the body, wherein an axis of said collar is not parallel to an axis of said at least one part.

25 The third object may be accomplished by an individual section machine for manufacturing a hollow glass product with an offset collar axis, including a roughing mold having a cavity with at least one upper part, a finishing mold, and a collar mold including a punch configured to form a collar of the hollow glass product and configured to position the punch alternately in the roughing mold and finishing mold such that an axis of the punch

form an angle between 60° and 180° with respect to a vertical axis. The at least one upper part is substantially vertical.

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#### BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention and many of the attendant advantages thereof will become readily apparent with reference to the following detailed description, particularly when considered in conjunction with the accompanying drawings, in which:

Fig. 1 is a schematic view showing the first stage of the successive stages in the fabrication process of a product according to an embodiment of the present invention;

Fig. 2 is a schematic view showing the second stage of the successive stages in the fabrication process described above;

Fig. 3 is a schematic view showing the third stage of the successive stages in the fabrication process described above;

Fig. 4 is a schematic view showing the fourth stage of the successive stages in the fabrication process described above;

Fig. 5 is a schematic view showing the fifth stage of the successive stages in the fabrication process described above;

Fig. 6 is a schematic view showing the sixth stage of the successive stages in the fabrication process described above;

Fig. 7 is a schematic view showing the seventh stage of the successive stages in the fabrication process described above; and

Fig. 8 is a schematic view showing the final stage of the successive stages in the fabrication process described above.

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## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred embodiments will now be described with reference to the accompanying drawings, wherein like reference numerals designate corresponding or identical elements throughout the various drawings.

5 With reference to Fig. 1, a roughing mold 1, which is a part of an individual section machine, receives in its cavity 2 a molten ball of glass 3. A first part 4 of the cavity 2 by which the molten ball 3 enters is approximately vertical. In addition to the first part 4, the cavity 2 is also shaped by a second part 5, which comes after the first part 4, shorter than the latter and with which it forms an angle of  $120^\circ$ . The roughing mold 1 includes a housing for receiving a collar mold 6. The collar mold 6 includes a punch 7 and the axis of the punch 7, which is represented by the reference numeral 8. Th axis 8 of the punch 7, which is traditionally vertical, is also inclined in conformity with the present invention by  $120^\circ$  with respect to the first part 4.

Also shown is machine axis 9 located in the central plane of the roughing mold 1, an axis 10 representing one of the components of the subsequent turning motion described below, which causes the intermediate glass product to pass from the roughing mold 1 to a finishing mold as well as the axes 11, 12 of the first and second parts 4, 5, respectively, of the cavity 2.

As illustrated by Fig. 2, the glass fills a lower part of the cavity 2 and a collar 13 of a flask is shaped by driving-in of the punch 7. Following retraction of the punch 7, a blank is formed by injection of compressed air as indicated by the arrow in Fig. 3, that is, in the body of the blank through collar mold 6.

The blank is then transferred to a finishing mold 14 of the individual section machine by a turning-over movement, while the collar mold 6 is being used as a gripping element of the blank as shown in Fig. 4. Also shown in Fig. 4 is a machine axis 15 of the finishing mold 14, which also corresponds to the median plane of the finishing mold 14, and the axis 16 of the collar mold 6 fixed in the finishing mold 14. A cavity of the finishing mold 14 is

constructed in such a manner as to maintain the angle relationships existed between the axes 8, 11, 12 in the roughing mold 1.

The following stage shown in Fig. 5 includes a blasting unit head 17 replacing the collar mold 6 in the finishing mold 14. The blasting unit head 17 supplies compressed air into the interior of the blank through the collar 13, thereby shaping the blank into the flask. The axis of the blasting head 17 is offset by  $120^\circ$  with respect to the vertical in the same manner as the axis 16 of the collar mold 6.

The process then includes, for example, the following operations:

gripping the flask by means of tongs 18 after opening the finishing mold 14 as shown in Fig. 6;

repositioning the tongs 18 with offset distance of  $120^\circ$  with respect to the vertical in order to turn to take the next flask as shown in Fig. 8.

In the gripping operation, the tongs 18 is advantageously articulated in order to be oriented depending upon the center of gravity of the assembly unit, thereby preventing deformation of the collar 13 that is still fragile as shown in Fig. 7

Thus, the present invention provides a hollow product made of thermoplastic material, especially of glass with a complex shape, in which the collar axis is offset with respect to the axis of at least one part of the body of the product as well as a fabrication process of such a product. The quality of a product achieved according to the present invention is excellent, in particular, due to the fact that homogeneous distribution of the thermoplastic material in the molds, especially in the vicinity of the collar, limited contact of the molten ball with the walls of the roughing mold, thereby decreasing thermal transfer and optimizing viscosity and flow of the material and satisfactorily filling of the bottom of the cavity in the roughing mold are achieved.

Obviously, numerous modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically described herein.